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TITLE: TECHNICAL RESOURCES OF FROGMEN OF CAPITALIST NAVIES

TECHNISCHE MITTEL DER KAMPF-SCHWIMMER DER SEESTREITKRAFTE KAPITALISTISCHER STAATEN

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TECHNICAL RESOURCES OF FROGMEN OF CAPITALIST NAVIES

[J. Haferberger. Technische Mittel der Kampf-schwimmer der Seestreitkrafte kapitalistischer Staaten; Militartechnik, June 1979, East Germany]

Frogman [underwater swimmer] units were first organized during tne Second World War. At present they are also included among the naval forces of a number of capitalist countries, as for example the U.S., FRG and France. They are used for combat missions at sea, on the coast, and inland from the coast. Frogmen are transported to the vicinity of their targets by surface or underwater vessels, aircraft, helicopters or by land. They generally approach the target in pairs or small groups and even individually. In doing so they swim underwater and use a series of technical assets for orientation and propulsion.

In addition to attaching mines to ships or protected targets in naval bases and coastal waters they are also used as minehunting divers, for underwater reconnaissance, for disposal naval mines and clearance of underwater obstacles and for commando operations on land.

Covert and surprise operations are characteristic of their use deployment. They continuously change operational site.

After the Second World War military specialists of the capitalist armed forces continued development of swimming and diving equipment, especially diving apparatus and diving suits.

They improved existing and developed new, more efficient assets so that at present the frogmen of these nations constitute an important diversionary tool for realization of their aggressive aims.

1. Frogman Equipment

Depending on the mission, equipment consists of breathing apparatus, diving suit, diving mask, fins, depth meter, underwater compass, underwater watch, and underwater flashlight in addition to individual life saving appliances; hydroacoustic gear, underwater and VHF-UHF communications equipment, underwater weapons and explosives.

1.1. Breathing Apparatus

Breathing apparatus allow longer time underwater. Depending on the type and manner of inhaling and exhaling of the breathing gas mixture we distinguish breathing apparatus with open, semiopen, and closed cycle. Compressed air is used in the first; after exhaling the air is forced into the water. It allows only a limited time underwater at depths up to 40 m and reveals the swimmer by rising air bubbles.

At present this breathing apparatus is used in general in group operations of divers, in disarming stray ammunition and in training of frogmen.

In apparatus of the second group (semiopen cycle) an artifical breathing gas mixture is used, i.e. an inert gas with reduced oxygen content. It allows diving down to depths of 250 m. When the swimmer inhales only oxygen is comsumed; the overflow of inert gas is periodically forces into the water and the carbon dioxide removed by a chemical absorber. Only one tenth as much of the breathing gas mixture is used compared to the first group.

In the apparatus of the third group (closed cycle) the breathing gas mixture likewise consists of oxygen and an inert gas. Pure oxygen is fed into the breathing line in exact agreement with the consumption standard via a portion pressure transducer. Hardly any inert gas is used during breathing and the carbon dioxide is removed as in the second group via a chemical absorber. These apparatus allow the diver to remain 6 to 12 hours at a depth of up to 400 meters.

Breathing apparatus with closed breathing cycle, as for example the Mk 10, model 4 (27.2 kg) and the most recent CCM-1 "Abolon" apparatus and the CCR-100 are used by U.S. frogmen in operations in the enemy rear.

1.2. Diving Suits

Here wet diving suits and dry diving suits are distinguished. They retain the body heat of the diver and protect him somewhat from underwater explosions.

Wet suits are made of porous rubber, neoprene. A thin layer of water between the swimmer and the diving suit is heated by the swimmers body and prevents rapid chilling. At a water temperature of 20° C the frogman can last one hour without chilling without a diving suit, four hours at a water temperature of plus 20° C with a wet suit and up to 1 hour in water with a temperature of 0° C. The time in cold water can be increased in a dry suit with a heatable combination.

1.3. Diving Masks

Simple and complicated diving masks with intercommunications gear are available which are used jointly with underwater sound connections. Recently helmet masks which cover the entire head with pressure compensation corresponding to water depth have appeared. They allow reception of acoustic signals in water and breathing through the mouth and nose.

Underwater night vision goggles (angle of view 60°) for a maximum water depth of 12 meters are used together with diving masks. They amplify light 10,000 times, compensate for the light refraction which prevails in water by means of spherical lenses and are powered by a 1.35 volt battery.

1.4. Individual Life Saving Apparatus

Life saving apparatus constitute an indispensible component of the equipment of a frogman. Life saving appliances are made of impregnated materials, like life jackets.

They make it possible to float a wounded or unconscious swimmer on the water surface. They ensure decompression breaks and keep the head of the swimmer above water.

2. Underwater Communications

Poor visibility under water and relatively high speeds of frogman propulsion equipment necessitate special gear for underwater orientation, for finding objects underwater, for leading the frogman to hydroacoustic navigational beacons, for intercommunications of frogmen and communications between frogmen and back-up facilities. Thus portable hydroacoustic equipment, underwater communications gear and hydroacoustic navigational aids are included in the equipment of frogmen of a number of capitalist countries.

2.1. Hydroacoustic navigational gear

Hydroacoustic gear of varied design (Table 1 contains information on certain French and U.S. gear) are used to locate underwater objects and to guide the frogman to dhydroacoustic navigation aids or noise objects. In active modes the gear operates at frequencies between 50 and 90 kHz. It determines direction and range and provides a rough classification of the object. In the passive mode the equipment operates at frequencies between 30 and 40 kHz. It receives signals inaudible to the human ear, allows location of other frogmen or underwater transport in addition to those underwater objects on which for example the U.S. Mk46 or Model 606 hydroacoustic system has been installed. The range of the Model 606 is 1 nm at an operating frequency of 37 kHz. The power pack allows 50 hours of operation. Maximum operating depth is approximately 60 m. Mass is 10 kg at a size of 23.8 cm x 30.5 cm x 38.1 cm. Compass and headphones are also included.

Portable hydraocoustic unit DMS-2 is used by frogman, but also on small boats and underwater transport. It is designed to locate underwater objects at ranges up to 190 m, can be used in depths up to 200 m and features a mass of 4.5 kg and dimensions 30 cm x 34 cm x 11 cm. The power pack allows 10 hours of operation in the acitve and 20 hours in the passive mode.

A small hydroacoustic unit with an operating frequency of 200 kHz and a pulse width of 50 microseconds was developed especially for frogmen. It is distinguished by great accuracy in direction finding of an object in a 40° search sector. Signals can be received from 9 to 11°. Bearing and range are video displayed. At the same time the frogman can detect moving targets over the headphones using the Doppler effect.

2.2. Hydroacoustic communications gear

Hydroacoustic communications gear is designed to provide telephone communication between frogmen, and to underwater transport, underwater craft and submarines. At the same time it is used as hydroacou tic gear. U.S. Navy frogmen use an PQC-1,2,4 units.

The AN/PQC-1 for example operates in the 8.3 to 12 kHz range, localizes ship noise in this range and acts as a radio beacon. In this regard a continuous tone with constant amplitude is emitted at a frequency of 9.2 kHz. Under normal hydrological conditions ranges is 450 m (non-directional) and 1850 m (directional) between frogmen, 3700 m in frogman links to surface ships and 9250 m in submarine links. Power packs are designed for 6 hours operation. The unit (10.43 kg mass with carrying case) includes an antenna with a directional pattern of 100°.

The AN/PQC-4 features a transmitted power of 10 watts and is mounted on the Mk 10 breathing apparatus. It provides intercommunications between frogmen and to ships and submarines of the U.S. and other NATO countries equipped with the AN/UQC-1 unit. It features two frequency ranges of 37 to 39 kHz at ranges up to 900 m and 8 to 11 kHz at ranges up to 2000 m.

The power source allows 6 hours operation or 1 hour continuous emission or 60 hours of reception.

Frogmen can also use a communications outfit UT-10 in the range from 25.3 to 28.3 kHz at ranges up to 3700 m in a calm sea, 1850 m in a moderate and 370 m in rough seas. Transmitted power is 20 watts, mass 2.5 kg at a size 20 cm x 17.5 cm x 14 cm.

Frogmen can also communicate with one another via an electronic megaphone by simply speaking into the water and receiving without additional gear. The human voice amplified by the megaphone can be heard up to a distance of 30 m, alarm signals with a deeper tone up to 100 m. The megaphone includes the diving mask and microphone, the amplifier in a plastic housing (belt mounted), power supply battery and the loudspeaker. The megaphone can operate at depths up to 100 m.

A mini-UHF-VHF unit for guidance and warning purposes was also developed for the frogman. It is attached to the chess and connected to the diving helmet by a cable. The frogman swims below the water's surface and only the antenna protrudes above the surface. In the guidance mode the directional antenna emits a uniform continuous tone. In the "signaling" mode a predetermined Morse signal 20 seconds long is emitted via the dipole antenna of the emitter. The 6 cm x 3 cm x 12 cm device features 3 channels with a range of approximately 1000 m.

Special electromagnetic communications links can be established to covertly guide the frogmen over short distances (50 to 100 m). The advantages of the electromagnetic links consists in better security compared to hydroacoustic means, in the opinion of Western military experts. Transmitters in a bay are difficult to localize because heavy noise of industrial origin can be registered in the vicinty of the water surface. In addition operations with electromagnetic links can be executed when objects which reflect hydroacoustic waves are located between the participants.

2.3. Hydroacoustic telemetric equipment

Portable underwater direction finder "Model 573 Directional Scanning"

was developed in the U.S. for frogman reconnaissance and Begleitung accompaniment. The device includes emission reflector. The localized objects are displayed optically or by signal on the meter.

"SCUBA" (Selfcontained underwater breathing apparatus) type hydroacoustic equipment is used in the study of the physiology of the underwater swimmer. It makes it possible to transmit information on cardiac activity of the swimmer under water, body temperature and similar readings to a vessel on the surface. For this reason an underwater container 30.5 cm long and 7.62 cm in diamters is attached to the SCUBA gear. Cable from physiological sensors are located on the container. After hook-up acoustic signals with a frequency of 55 kHz are continuously transmitted with the nece-sary physiological information.

2.4. Special hydroacoustic gear

In conjunction with the development of hydroacoustic gear to safeguard the activities of frogmen a special technology is being developed for protection of the coastal zone from the infiltration of frogmen. A system of stationary hydroacoustic buoys has been established in the U.S. which are called "coastal underwater groups." The primary purpose of these buoys is to locate frogmen and minisubmarines. The system is linked by wire and radio to shore stations. It is a component of the general system for reconnaissance of the underwater situation "SOSUS" designed to locate and identify silent submarines underwater in the oceans of the world.

3. Weapons and explosives

3.1. Weapons

Weaponry consists of jet underwater rifles and compressed air pistols with optical sights which fire spears to distances of 10 m in water and 250 m on land.

The most important individual weapon of the frogman is a flat knife of nonmagnetic steel.

3.2. Explosives

Explosives are manufactured in the form of special mines and explosive charges. Small mines with a mass from 10 to 15 kg can be used at depths up to 10 m and can be attached to a target by magnets, adhesive or clamps; on the other hand medium charges at 30 to 50 kg can be placed at depths up to 30 m. Large mines on the other hand are placed beneath the target on the bottom of the sea. Mines are equipped with mechanical, hydrostatic, inductive and other mechanisms and feature static, dynamic or combined fuses. Delay can extend from 20 minutes to several hours or even up to days.

Standard explosive charges of varied purpose are use for subversive operations and to destroy natural and man-made frogman obstacles. U.S. Navy frogmen use for example 0.5,1,2, and 2.5 pound general purpose charges for

underwater demolition in addition to
-shaped charges for breaking cables and power lines.
-elongated charges for penetrating reefs, mine fields and antiship obstacles.

Bandladung strip charge M 186 15.2 m long with a mass of 14 kg is coated with an adhesive, includes 15 holes for detonators and can be cut into individual charges of the required length and mass. Special explosive packets containing standard explosive charges linked by Zundschinire ignition fuses are most widely used.

Stachel Mk 133 contains eight 2.5 pound charges, the Mk 135 ten 2 pound charges Mk 20. A frogman can carry up to five explosive satchels.

For demolition operations the frogman receives an explosive satchel with simple and [illegible] fuses, magneto, wire wound coil, fuse pliers, metal shears, knife, ruler, box with water-proof material, insulating tape and galvanometer.

4. Transport

4.1. General transport

According to Western publications the following means of deliver and recovery of frogmen are available:

-fast and other surface ships and boats. For example frogmen are delivered by fast patrol boats at relatively high speeds by rolling off rubber boats attached alongside in succession into the water at short intervals.

-from submarines on or below the surface. The submarines approach the coast up to minimum diving depth and the frogmen are delivered through the torpedo tubes or through special hatches.

Greater distances can be covered with smaller boats, such as rubber rafts with quiet engines.

-Frogman can be air dropped over land or sea using parachutes. The drop is carried out from aircraft at speeds up to 250 km/h and from helicopters. Frogmen can also jump unassisted over the sea from heights of 10 to 15 m.

In addition, depending on the combat situation, there is a series of other possibilities for delivery of frogmen. The distance of the drop point from the coast depends on the situation and the mission. If the drop is made at a greater distance auxiliary means are needed.

4.2. Special transport

Pegasus type transport developed in France to haul frogmen and light-divers is used in France, Great Britain, Spain and the FRG. A container with monitoring, measuring and navigational equipment is housed in the nose of the transport as are the fore diving planes. Containers for

searchlights and other equipment can also be mounted here.

A saddle for the diver is located in the middle, the propeller and vertical rudder astern. A silver-zinc battery with a capacity of 80 Ah and an electric motor with a power of 1.1 kW at 7500 rpm are housed within the diver transport.

In the U.S. different transports and towed devices for frogmen are used, as for example one and two seat boats of the "minisub" and "Mark IV" type has been adopted. Electric drives are generally used on multiseat transport. Drives which operate on the basis of hydrogen peroxide and compressed gas but also gas and steam-gas turbines are used on single seat towing devices. The main advantage of the gas turbine is that in this case the towing devices can be manufactured from antimagnetic material and is thus more difficult to locate.

Single seat transports and towing devices for frogmen are generally compact and of small mass.

An entire series of underwater transports was developed in Great Britain for frogmen. One is 5 m long, and 0.45 m wide. A silver-zinc battery is used as the energy source; the power of the electric motor is 3.7 kW, maximum speed 5.5 km/h. working depth up to 40 m. One frogman can be transported on each side of the transport. The head cell with equipment compartment and toggle switches which control the transport are located in front of the frogman. The hardware of the U.S Navy includes one, two, four, and five seat underwater transports and one man towing devices. In the one, two and four seat version of the underwater transports the frogman is not isolated from the surrounding water. Therefore they use breathing apparatus or connect up to the onboard system to reduce comsumption of the carried breathing gas mixture. This underwater transport delivers divers in a short time at a maximum speed of 8 knots.

The divers are isolated from the surrounding water in the five seat version and do not wear diving helmets. Oxygen is supplied from an onboard system. The underwater transport is flooded to deposit the frogman. These underwater transports deliver frogmen over great distances at speeds in excess of 8 knots. The swimmer is buckled on at the top in the one man version. He is not protected from the pressure of water flow. Table 2 shows the most important tactical and technical specification of the aforementioned underwater transport models.

Underwater transport and towing devices are equipped with magnetic and gyro compass, gyro horizon, depth gage, speedometer, clock and water penetration indicators. They may be equipped with an underwater camera and carry the AN/WQS-1 hydroacoustic unit. (range 450 m, operating frequency 200 kHz).

The use of frogmen by capitalist nations is still important under the conditions of modern naval warfare. According to NATO military men, the Baltic offers especially favorable conditions for the use of frogmen and miniweapons.

The following commentary was published on frogmen of the German Navy in Die Welt on May 9, 1979: "Male of the Baltic Coast, as they are called in Army jargon. Their mission is surprise, their vehicle the night. They disappear as mysteriously as quietly as they arrive. This is not fiction, but reality. The stage is the German Baltic coast, more precisely the bay at Eckernfoerde. Here the frogmen, a small but highly efficient special Navy unit, train, usually at night.

In conclusion, it is necessary to thoroughly learn the operating conditions, technical and tactical potential of the marine mine weapons and frogmen in order to be able to properly organize countermeasures.